PATENT SPECIFICATION

598,240

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Complete Specification Left: July 16, 1945.

Complete Specification Accepted: Feb. 13, 1948.

PROVISIONAL SPECIFICATION

Improvements in or relating to Holders for Boring Tools

We, JOHN ARTHUR BOWDLER, of "Sirrah", Testwood Lane, Totton, Southampton, and ERIC WILFRED BELLAMY of 49, Wold Road, Hull, British subjects do hereby declare the nature of this invention to be as follows:—

The present invention relates to that type of boring tool holder where the tool is either rotated within stationary work or is held stationary while the work rotates, i.e. usually consisting of a boring bar with a shank fitting either the rotating mandrel of a machine or some form of fixture such as a capstan turret, tailstock, or the like. It is intended for the precision sizing of holes an operation frequently attempted by using reamers or end mills. Reamers of any kind follow inaccuracies in the location or alignment of the hole, whilst end mills of any sort together with plain reamers rapidly blunt and produce undersize holes. Their replacement is costly. The simple detachable cutter of a boring bar has none of these disadvantages, and the final accuracy of diameter and location of the hole are entirely unaffected by initial irregularity.

The object of the invention is to provide means of readily adjusting the cutting diameter to fine limits. In this way, the original setting of the cutter in the bar need not be depended on for accuracy. A bar of the type described consists of a shank fitting the machine mandrel and extending far enough for the required depth of bore. Near its outer end is provided a cross hole in which a cutter is clamped. By slanting this hole the cutter may be brought very close to the end of the bar and can be secured by a set screw in another slanting hole at right angles to the cutter hole. By providing two cutters, one in advance of the other longitudinally of the bar, rough and finish cuts can be taken in on operation.

In this invention, the cutter bar is separate, and axially bored from its inner end to form a sleeve portion which is a close fit on a parallel spigot extending from the shank. This spigot is very slightly eccentric to the shank, for example approximately .006", so that by rotating the cutter sleeve on the spigot a variation in cutting radius up to twice the amount of eccentricity is obtainable. Concentric with the spigot at its inner end is an enlarged diameter in which a worm-wheel type thread is cut. An enlarged inner end to the cutter sleeve is counterbored to accommodate this, and also carries a screw-threaded shaft engaging the worm, rotatable from outside the sleeve by a key or like device. The enlarged end of the sleeve is provided with means for clamping it on the spigot. either by a set-screw or by being axially split and clamped. A flange between shank and spigot is arranged as a thrust face for the inner end of sleeve, and these two parts can be the same diameter, and carry associated graduation marks to give a direct reading of the change in diameter of cut produced by rotating the sleeve on the spigot.

It can be arranged so that the direction of the cutting force would, in the case of slip between sleeve and shank, rotate the former in the diameter-reducing direction, so that the accidental cutting of an oversize hole becomes impossible.

With the two cutters mentioned, the finishing one could be set to take the lightest of cuts so that blunting would be very infrequent. The tool could thus remain set for cutting to an exact size for long periods, all intermediate sharpening being done on the roughing cutter.

Dated this 9th day of Novemer, 1944.

For the Applicants,
C. H. CLARKE,
Chartered Patent Agent,
24, Hermon Hill, London, E.11.

COMPLETE SPECIFICATION

Improvements in or relating to Holders for Boring Tools

We, JOHN ARTHUR BOWDLER, of "Sirrah", Testwood Lane, Totton, Southampton, and ERIC WILFRED BELLAMY of 49, Wold Road, Hull,

[*Price* 1/-]

British subjects do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to that type of boring tool holder where the tool is either rotated within stationary work or is held stationary while the work rotates, i.e. usually consisting of a boring bar with a shank fitting either the rotating mandrel of a machine or some form of fixure such as a capstan turret, tailstock, or the like. It is intended for the precision sizing of holes, an operation frequently attempted by using reamers or end mills. Reamers of any kind follow inaccuracies in the location or alignment of the hole, whilst end mills of any sort together with plain reamers rapidly blunt and produce undersize holes. Their replacement is costly. The simple detachable cutter of a boring bar has none of these disadvantages, and the final accuracy of diameter and location of the hole are entirely unaffected by initial irregularity.

The object of the invention is to provide means of readily adjusting the cutting diameter to fine limits. In this way, the original setting of the cutter in the bar need not be depended on for accuracy. A bar of the type described consists of a shank fitting the machine mandrel and extending far enough for the required depth of bore. Near its outer end is provided a cross hole in which a cutter is clamped. By slanting this hole the cutter may be brought very close to the end of the bar and can be secured by a setscrew in another slanting hole at right angles to the cutter hole. By providing two cutters, one in advance of the other longitudinally of the bar, rough and finish cuts can be taken in one operation.

In this invention, the cutter bar is separate, and axially bored from its inner end to form a sleeve portion which is a close fit on a parallel spigot extending from the shank. This spigot is very slightly eccentric to the shank, for example approximately .006", so that by rotating the cutter sleeve on the spigot a variation in cutting radius up to twice the amount of eccentricity is obtainable. Various methods of carrying this out are shown in the accompanying drawings in which Figure 1 is a longitudinal section of a complete boring tool, Figures 2 and 3 are elevations thereof at right angles, Figure 4 is a cross section on line AA Figure 3, and Figure 5 is a detail. Figure 6 is a view similar to Figure 1 showing a modification for boring small holes, and Figure 7 is a cross section on line BB of Figure 6 showing also a modification in detail. Figures 8 and 9 show further modifications of shape.

The shank 1 is made to fit the machine, usually with a Morse taper, and is axially in line with the work. It is carried either by a rotating mandrel, or by a fixed part such as a turret or lathe tailstock whilst the work rotates. It may be fed into the work or the work fed towards the tool. Projecting from the shank is a spigot 2, the axis of which is slightly eccentric to the work-shank axis as shown by the displacement *d* of their centre lines in Figure 1. Fitting on the spigot 2 is a sleeve 3, the outer end of which is solid and carries in normal manner one or more cutter bits 4. It will be seen that if the sleeve is rotated on the spigot the cutting radius of the bits will be altered, and this is the essential feature of the invention. The inner end of the sleeve is provided with an enlarged part 5 which serves to carry a worm thread 6 engaging corresponding worm teeth 7 formed on the spigot, for the purpose of giving fine adjustment to the relative rotation between spigot and sleeve. To enable the thread to be put in place, its thrust flange is formed with a flat 8 (Figure 5) which will clear the worm teeth. The plug 9 keeps the thread in place, takes thrust in the other direction, and takes up end play. The sleeve is slit longitudinally at 10 through its enlarged end and a screw 11 across the slit is provided for clamping the sleeve to the spigot.

Adjacent the enlarged head 5 the shank is provided with a flange 12 of the same diameter and concentric to the head, i.e. eccentric to the shank. The flange not only serves as thrust support for the sleeve, but may carry graduation marks as shown, against which a zero mark 13 on the head may give a reading of the change in cutting diameter. It is not advisable that it should read absolute diameter of cut, as the essence is adjustment to get this after a rough setting of the cutters 4. As half the circumference is available for the maximum change in cutting diameter, equal to four times the eccentricity *d*, a wide reading scale for minute changes in adjustment is possible. Where, however, some form of direct reading scale is used, it will be necessary to have separate zero marks for different materials, and this can be done by having the marks on separate and detachable rings, each being marked with the respective material, which fit on in a positively located circumferential position. On the other hand, boring tools set to a standard size ought to be marked or indicated in some way with the material on which

they were last used to give that size, thus warning of the necessity for further adjustment if they are to be used on another material.

In order to avoid any weakening of the base of the spigot by cutting the worm teeth therein, the spigot at this part is made of larger diameter as shown and the head of the sleeve counterbored correspondingly.

With the two cutters shown, the inner (finishing) cutter can be set to take the lightest of cuts so that blunting would be very infrequent. The tool could thus remain set for cutting to an exact size for long periods, all intermediate sharpening being done on the roughing cutter.

For holes too small to take a boring bar with detachable cutter, a boring tool with slender stem as used in a slide rest must be used. Such a tool can be fixed to project substantially axially from the solid end of the sleeve. In this case the sleeve and spigot are very much shorter and of larger diameter. This form is shown in Figure 6, where a solid boring tool slender enough to enter the hole has an enlarged end 4a clamped in a substantially axial hole in the sleeve set-screw 14. The "axial" hole is placed at a slight angle with the axis so that rough setting for diameter of cut, and compensation for grinding of the tool, can be obtained by endways positioning of the tool in the hole. The inner end of the tool can be accommadated in a recess 2a in the end face of the spigot.

Figure 7 shows also a modified method of keeping worm thread in place. A thrust collar 15 is screwed on the end and locked by a screw 16 of finer pitch or opposite handed thread.

Figures 8 and 9 show modified shapes of spigot and methods of ensuring rigidity between sleeve and shank. In Figure 8 the spigot is taper, and an annular seating 17 is formed on the flange 12 fitting a corresponding groove in the face of the head of the sleeve. In Figure 9 a conical seating 18 is provided at the base of the spigot.

It will be seen that cutting strain tends to rotate the sleeve on the spigot and thus alter the tool setting, this force being borne by the worm and the friction between the clamped parts. If the circumferential relationship between sleeve and spigot is that where the largest diameter is cut, then any such alteration would result in cutting a smaller diameter and the work would not be spoilt. From this position, either half of the circumference could be used for adjustment, but in order to avoid any risk from a possible slip, e.g. if the clamping screw slackens and the worm rotates by vibration, it is preferable to use that half where the diameter of cut would be reduced by that direction of relative rotation caused by the cutting force. To prevent use of the other half, the worm teeth may be cut only a part of the way round the spigot; rather more than half, as shown in Figure 7.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is:—

1. A boring tool holder comprising a fixing shank with an axis coincident with the boring axis, a spigot projecting from the shank with an axis slightly eccentric to the shank axis, and a cutter-carrying member rotatably mounted on the spigot.

2. A boring tool holder as claimed in claim 1 adapted for taking a tool substantially axially projecting towards the work from the end of the cutter-carrying member, in which a hole for receiving the tool is at an angle with the axis to provide for initial radial adjustment of the tool by its endways positioning in the hole.

3. A boring tool holder as above claimed provided with means for fixing the cutter-carrying member in circumferential relationship with the boring axis

4. A boring tool holder as claimed in claim 3 with a sleeve-form portion to the cutter-carrying member, in which said fixing is provided for by longitudinally slitting the sleeve and contracting its diameter by means of a clamping screw across the slit.

5. A boring tool holder as above claimed provided with means for rotating the cutter-carrying member comprising a rotatable worm-thread carried thereby engaging worm teeth cut in the part on which it is to be rotated.

6. A boring tool holder as claimed in any of claims 1—5 in which the shank is provided with a thrust flange against which is seated an enlarged end of the cutter-carrying member.

7. A boring tool holder constructed, arranged or operated substantially as described with reference to the accompanying drawings.

Dated this 14th day of July, 1945.
For the Appicants,
C. H. CLARKE,
Chartered Patent Agent,
24, Hermon Hill, London, E.11.

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598,240 COMPLETE SPECIFICATION

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

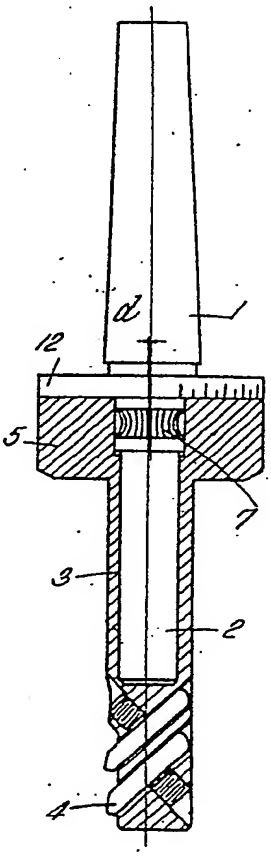


Fig. 2.

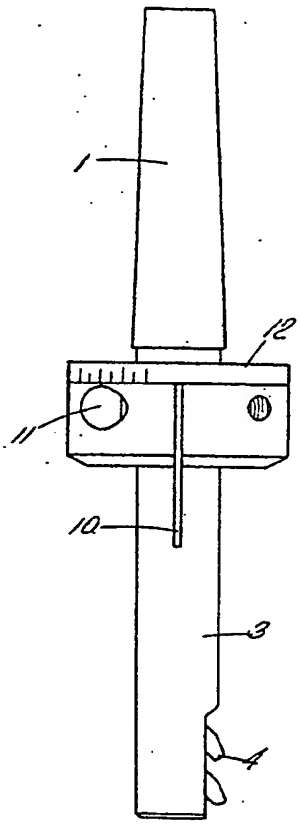


Fig. 3.

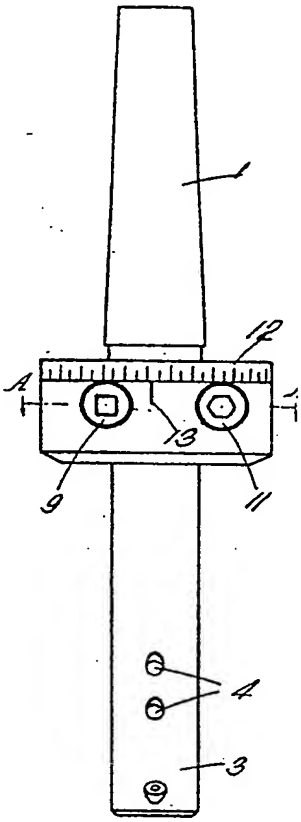


Fig. 5.

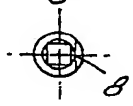


Fig. 4.

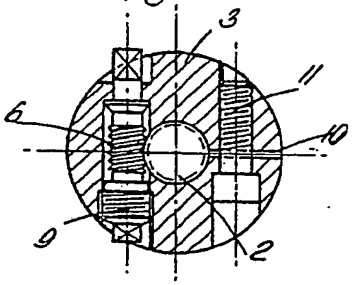


Fig. 3.

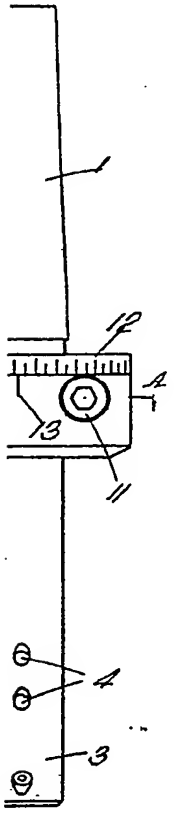


Fig. 6.

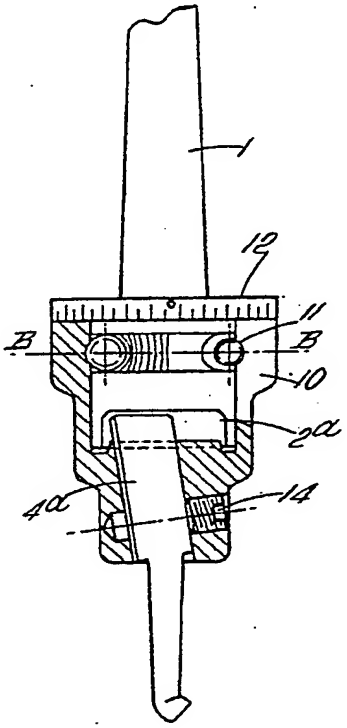


Fig. 8.

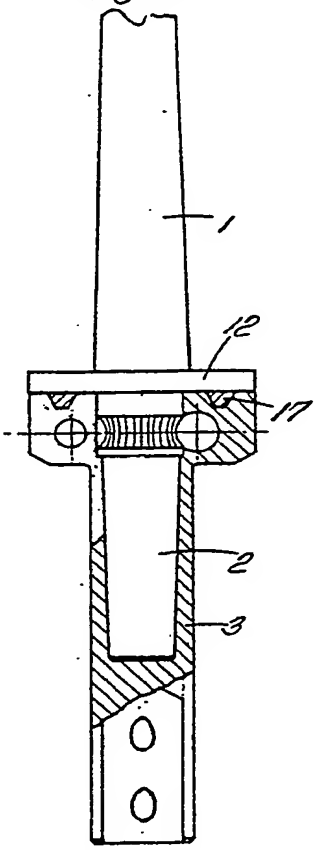


Fig. 9.

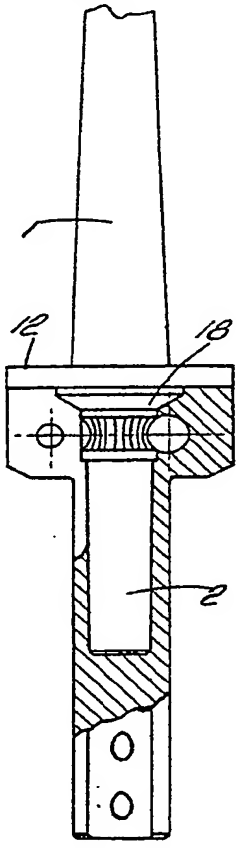
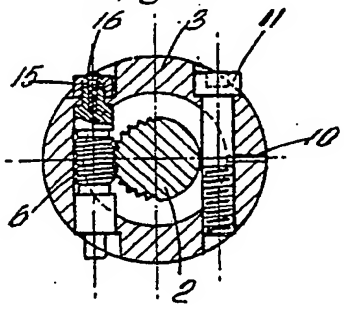


Fig. 7.



H.M.S.O.(Ty.P.)

598,240 COMPLETE SPECIFICATION

2 SHEETS
SHEET 1

SHEET 2

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

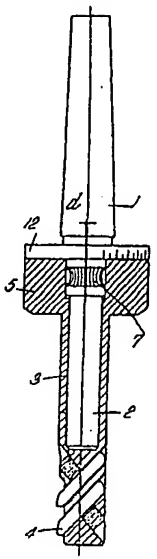


Fig. 2.

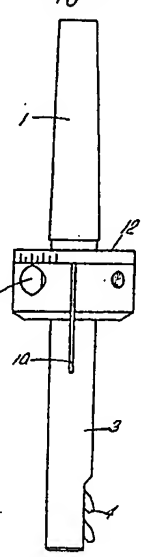


Fig. 3.

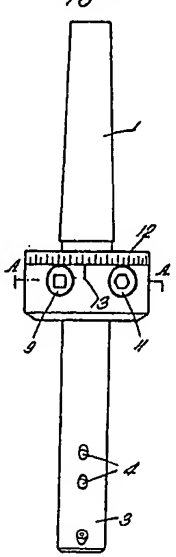


Fig. 5.

Fig. 4.

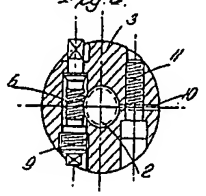


Fig. 6.

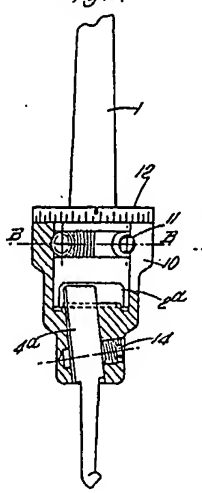


Fig. 8.

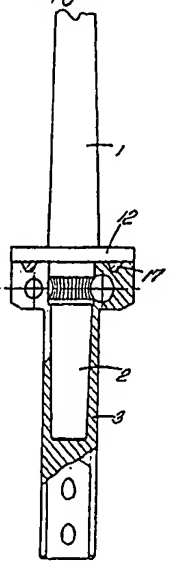


Fig. 9.

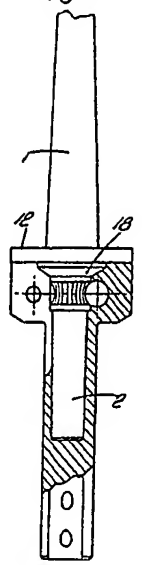
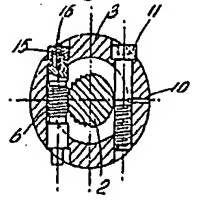


Fig. 7.



H.M.S.O.(Ty.P.)